



International Journal of Allied Medical Sciences and Clinical Research (IJAMSCR)

ISSN:2347-6567

IJAMSCR /Volume 6 / Issue 2 / Apr - Jun - 2018
www.ijamscr.com

Research article

Medical research

To find the reference values of arch index in normal females (18 - 25) by footprint method- a survey-based study

**Dr. Geeta Sahane (BPTH)¹, Dr. Varoon Jaiswal (MPH)², Dr. Snehal Ghodse
(Principal)³**

MAEERS Physiotherapy College, Talegaon Dabhade, Pune

¹*BPTH Intern, MAEERS'S Physiotherapy College, Talegaon Dabhade, Maharashtra, India.*

²*Associate Professor, MAEER'S Physiotherapy College, Talegaon Dabhade, Maharashtra, India.*

³*Principal, MAEER'S Physiotherapy College, Talegaon Dabhade, Maharashtra, India.*

***Corresponding Author: Geeta sahane**

Email id:geetasahane2404@gmail.com

ABSTRACT

Background

Conventional shoes and sandals are built with features which reduce the workload of the foot's intrinsic muscles, these features potentially interfere with the normal function and development of arch. If shoes weaken the intrinsic muscles, they could increase the likelihood of pes planus. overpronation is linked with a greater risk of injury due to increased rearfoot motion, tibial accommodation and other components of the lower extremity kinematic chain. The arch index is a relationship between central and posterior regions of the footprint. So the current study focuses on an attempt to find the reference value of the arch index of the foot.

Purpose of the study

To find the reference values of the arch index in normal females using foot print method.

Materials and methodology

After fulfillment of the inclusion criteria, a total 100 subjects were selected. The ink footprints were taken by equally impregnating the foot with ink in the ink box and requesting the person to put the right foot on to the platform but left a foot out of the platform and asked the person is asked to stand up weight bearing on both the limbs equally and sit down again. Slowly the foot is lifted from the paper. Assessment of outcome measures was simple ink foot print method.

Results

The results show that statistically, average mean of the sample population (0.58) lies in a normal distributed curve with 69 % of population lying in 1SD from mean and 96% of population lying in 2SD from mean calculated from the Z score referring to the Z score table distribution.

Conclusion

Based on this study, it was observed that even after excluding flat foot, the value of arch index of some individuals were very low and some individuals were high, it is probably due to the skeletal structure and function of the foot, the footwear you use daily, which we did not objectively measure.

Keywords: Ink footprint, Arch index, Staheli's plantar arch index (SPAI), Navicular drop test.

INTRODUCTION

The foot consists of 26 bones and more than 30 articulations enabling three fundamental functions: supporting, shock absorbing, and weight bearing. Many factors influence the structure and functioning of the foot, the body weight, body posture, muscle strength, the type of footwear, and other external factors. The foot has two functions: to be a strong and stable support for the body, and the lever to ambulation. This double function makes feet to present a unique behavior during ambulation when it is submitted to a successive load and unload cycle. The deformation experienced by the medial longitudinal arch during support makes, it to be the region suffering the highest variations in a human body. These functional features make a clinical examination of this region complex [1-5].

The foot has three arches: two longitudinal (medial and lateral) arches and one anterior transverse arch. They are formed by the tarsal and metatarsal bones and supported by ligaments and tendons in the foot. The flexibility conferred to the foot by these arches facilitates functions such as walking and running [6-9].

The medial arch is formed by the calcaneus, talus, navicular, three cuneiforms and first three metatarsal bones.

- Muscular support: Tibialis anterior and posterior, fibularis longus, flexor digitorum longus, flexor hallucis, and the intrinsic foot muscles
- Ligamentous support: Plantar ligaments (in particular the long plantar, short plantar and plantar calcaneonavicular ligaments), medial ligament of the ankle joint.
- Bony support: Shape of the bones of the arch.
- Other: Plantar aponeurosis.

Pes cavus is foot condition characterized by high medial longitudinal arch appearing in early life and can become symptomatic with increasing

age. Due to this, the ability to absorb shock during ambulation and the weight distribution over the foot changes causing pain and postural changes in body especially visible in the hip, knee, and hind foot more during the gait cycle.

Pes planus is foot condition characterized by loss of the longitudinal arches. Pes planus results in the midfoot region pronating towards the ground, and in some cases touching the ground completely. Excessive or overpronation of the midfoot can cause a cascade effect through the ankle, knee, and hip via inducing changes of tibial and femoral rotation and altering the normal dynamic control of these joints. These changes, although sometimes subtle, can predispose your knee and hip joints to increased instability and an increased likelihood of acute trauma.

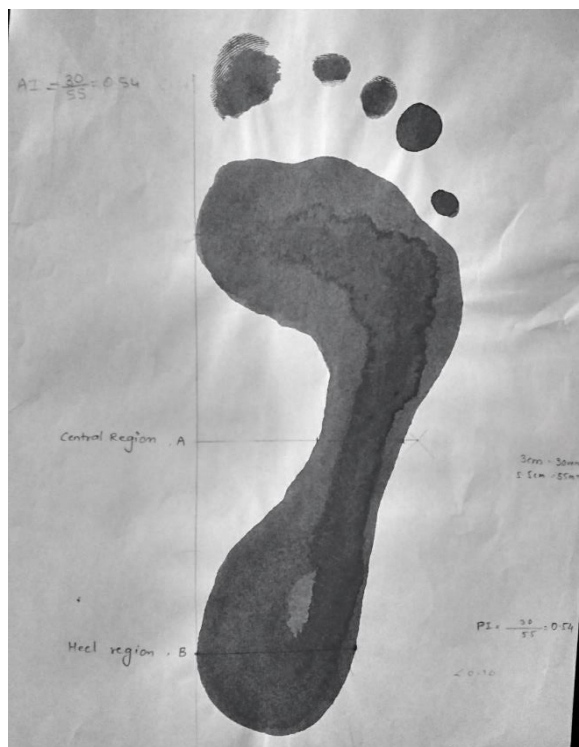
The arch index is a relationship between central and posterior regions of the footprint. According to the pediatric orthopedic society:- A normal planter arch index is the one comprises within 2 standard deviations (SD) of the population average. Thus, PI values equal or above the sum of 2 SD with the average were considered as indicative of flat foot.

The hypothesis suggests that usage of different footwears which give very limited stability and decent support to the foot, has lead to increase in flat footedness rapidly. Maintaining the arch height is more important now than ever as arches maintain the proportional distribution of the body weight. The concavity of the arches protects the plantar vessels and nerves from compression.

Conventional shoes and sandals are built with features which reduce the workload of the foot's intrinsic muscles, these features potentially interfere with the normal function and development of arch. If shoes weaken the intrinsic muscles, they could increase the likelihood of pes planus. overpronation is linked with a greater risk of injury due to increased rearfoot motion, tibial accommodation and other components of the lower extremity kinematic chain.

Many articles are coming forth about pain related to reducing arches of the foot as there are changes there may be shifting in the normal values

also thus to know the normal range of arch index is important. This study is an attempt to find the reference value of the arch index of the foot.



AIMS AND OBJECTIVES

Aim

To find the reference values of the arch index in normal females using foot print method.

Objectives

To assess the arch index of the foot by ink footprint method.

MATERIALS AND METHODOLOGY

This survey-based study was conducted in outpatient department setup of tertiary care centers and it was approved by the institutional ethical committee. A total of 100 healthy women within the age group of 18-25 years with navicular drop test < 10-15 mm were included in the study after screening them. Written informed consent was taken from all the subjects before participation in the study. An individual with history surgery of ankle or foot, flat foot, any postural deformity in lower extremity were excluded from the study. A written informed consent including detailed explanation purpose and procedure of the study was

taken from all the subjects before beginning the study. Demographic data was obtained from all the subjects prior.

Materials used for the study

- Plane A-4 size paper, ink box, Pen paper, Long scale, Compass, Chair
- Patient's preparation
- Shoes and sock to be removed.
- Chair of height was the person's feet touch the ground but do not fold above 90 degrees.

PROCEDURE

All the subjects with inclusion criteria were selected. A written consent was obtained from the subject. Demographic data of each subject was taken. Navicular drop test was performed to screen for flat foot. All the parameters: height, weight, BMI was measured before the ink footprint were taken. A plastic platform with a plane paper which is immobilized with the help of clips is kept on smooth surface. The person is seated in front of the platform and the foot to be studied is equally

impregnated with ink in the ink box and requested the person to put the right foot on to the platform but left foot out of platform, now the person is asked to stand up weight bearing on both the limbs equally and sit down again. Slowly the foot is lifted from the paper. Instruction to not move the limb after placing it on the paper is told. Measurement is taken by measuring scale. By using foot print Staheli's planter arch index (SPAI) was calculated as a line drawn tangent to the medial forefoot edge and at heel region. The mean point of this line is calculated. From this point a perpendicular line is drawn crossing the footprint. At the heel perpendicular line is drawn at maximum width of foot print thereby obtain them measurement of the width of central region (A), and of the heel region (B) in millimeters. Staheli's plantar arch index (SPAI) was obtained by dividing the A value with the B value. $SPAI = A / B$.

RESULT

- **DEMOGRAPHIC DATA:** 100 female subjects participated in the study.
- In the age group of 18-25, in the examined subjects, it was observed that even after excluding flat foot, the value of the arch index of some individuals was very low and some individuals were high.
- The results show that statistically, average mean of the sample population (0.58) lies in a normal

distributed curve with 69 % of population lying in 1SD from mean and 96% of population lying in 2SD from mean calculated from the Z score referring to the Z score table distribution.

DISCUSSION

- The current study was undertaken to assess the normative values of the arch index in normal individuals using foot print method – a survey-based study.
- For the purpose of the study, 100 individuals with normal arch index were included. Navicular drop test (sit to stand) was performed to diagnose pes planus. Foot print was taken in sit to stand position.
- In the study foot print method is the tool used to evaluate arch index of the foot.
- In this study, it was observed that even after excluding flat foot, the value of the arch index of some individuals were very low and some individuals were high, it is probably due to the skeletal structure and function of the foot, the footwear you use daily, which we did not objectively measure.

CONCLUSION

The arch index values for 18 – 25 age group for females were found from this study. Which are as follows:

Age Group	Sex	Mean Value	SD	2SD	3SD
18 – 25	F	0.58mm	0.14mm	0.28mm	0.42mm

ACKNOWLEDGMENTS

We thank all the participants who gave the consent to participate in the study

REFERENCES

- [1]. Bandholm T, Boysen L, Haugaard S, Zebis MK, Bencke J: Foot medial longitudinal-arch deformation during quiet standing and gait in subjects with medial tibial stress syndrome. *J Foot Ankle Surg.* 47(2), 2008, 89-95. 10.1053/j.fas.2007.10.015.

- [2]. Bennett JE, Reinking MF, Pluemer B, Pentel A, Seaton M, Killian C: Factors contributing to the development of medial tibial stress syndrome in high school runners. Journal of Orthopedic and Sports Physical Therapy. 31(9), 2001, 504-510.
- [3]. Loudon JK, Jenkins W, Loudon KL: The relationship between static posture and ACL injury in female athletes. J Orthop Sports Phys Ther. 24(2), 1996, 91-97.
- [4]. Brody DM: Techniques in the evaluation and treatment of the injured runner. Orthop Clin North Am. 13(3), 1982, 541-558.
- [5]. Reliability of Open Subtalar Joint Neutral Positions and NAVICULAR Drop Test. Ann Marie Picciano, MS, PT, ATC' Megan S. Rowlands, MS, PT2 Teddy Worrell, EdD, PT, SCS, ATC3.
- [6]. Dr. RAJENDRA SINGROLAY and Dr. RAJENDRA SINGH KUSHWAH. Staheli's plantar arch index measured by simple footprint method is an effective diagnostic tool for the flat foot as other radiological methods- A comparative study.
- [7]. Arnold José Hernandez. Calculation of the Staheli's planter arch index and prevalence of flat feet; a study with 100 children aged 5-9 years.[Int J Pediatr Obes. 2(1), 2007, 22-34.]
- [8]. Kanatli U, Yetkin H, Cila E. Footprint and radiographic analysis of the feet. [J Pediatr Orthop 21(2), 2001, 225-8]
- [9]. Morton DJ. Foot disorders in general practice. J Am Med Assoc. 1937

How to cite this article: Dr. Geeta Sahane (BPTH), Dr. Varoon Jaiswal (MPTH), Dr. Snehal Ghodey (Principal). To find the reference values of arch index in normal females (18 - 25) by footprint method- a survey-based study. Int J of Allied Med Sci and Clin Res 2018; 6(2): 408-412.

Source of Support: Nil. **Conflict of Interest:** None declared.